passage along the course of the intestine followed on the fluorescent screen. The air forms a very definite band of relatively high transradiancy. The size, shape, and position of all parts of the large intestine can usually be traced out by this means. The presence of air has a further advantage in that the solid organs of the abdomen stand out in sharp relief against the light background formed by the air-containing large intestine. Thus the lower edge of the liver is shown up as a well-defined margin; the upper margin of the liver is always obvious, as its domed surface lies in contact with the diaphragm on the right side, and has the base of the right lung immediately above it. On viewing the patient's back (especially if he lie prone on a couch with a loosely filled air-pillow under the abdomen, the X-ray tube being contained in a box under the couch), the shadows of the kidneys are shown one on each side of the vertebral column, and their movements up and down with respiration are easily observed. Should either kidney contain a calculus (stone), this is shown on the fluorescent screen, and it is seen to move with the kidney on respiration.

In a large proportion of cases in which there are symptoms suggesting the presence of a calculus, the Röntgen-ray examination shows that no calculus is, in fact, present. On the other hand, cases are by no means uncommon in which one or more calculi are found by the Röntgen-ray examination, when the clinical examination had led to an entirely different diagnosis. In these cases the calculi may be removed by the surgeon, and the patient cured.

There is another, an indirect, method of studying the digestive canal. For this method we are indebted to Prof. Rieder, of Munich, who discovered that large doses of bismuth salts may be given to patients without fear of ill effects. The salt used by Rieder in the first instance was the sub-nitrate. Unfortunately, several cases occurred in America in which the administration of large doses of sub-nitrate of bismuth was followed by fatal results, and we now know that this result was due to the formation of nitrous acid in the stomach, probably through the action of bacteria. The carbonate of bismuth is now commonly used, and it is a perfectly inert and harmless substance. Two ounces is the dose usually employed, though three or four ounces may be given at a time. It is important to use a pure preparation, for the presence of arsenic or selenium as an impurity becomes an important source of danger where large doses are used.

By placing the patient upright in front of the X-ray tube, and trans-illuminating him in an oblique direction, the course of the food-pipe is revealed, occupying a clear space in front of the vertebral column. If the patient be now given an emulsion containing about two ounces of carbonate of bismuth to drink, the course of this drink from the mouth to the stomach can be observed upon the fluorescent screen, as the bismuth-containing fluid throws a very opaque shadow. Any obstruction in the food-pipe, or any deviation in its course, at once becomes apparent. The bismuth having passed through the food-pipe, it is now seen in the stomach occupying the most dependent part of that organ. The opening in front of the X-ray tube-box is now closed down to a small size, and this part of the stomach is examined in detail. The regular contractions by means of which the contents of the stomach are expelled into the small intestine may now be observed, and any irregularity in the shape of the stomach or obstruction at its orifice is clearly shown.

Some hours later the course of the bismuth meal may be clearly traced in its path through the large intestine, and here again the exact size, shape, and position of all parts of the large intestine is shown in strong relief through the opaque mass of bismuth with which the fæcal masses are mixed. These bismuth meals thus constitute a most valuable diagnostic method, and pathological conditions, the recognition of which is of extreme importance, are frequently shown in a manner more certain than is to be obtained by any other means of diagnosis.

One of the newest books dealing with the Röntgen-ray method of diagnosis as applied to diseases of the chest is that of Dr. Hans Arnsperger.[1] Improved apparatus and improved methods have led to so rapid an advance in this branch of study that few physicians have been able to keep pace with it. The literature is already large, and is rapidly extending. Dr. Arnsperger has given a full review of the literature, and has made a full and laborious exposition of the subject. He has lost no opportunity of discussing the application of the Röntgen-ray method to the elucidation of contentious problems in physiology and pathology. It is true some of the physiological views expressed by those who have studied the Röntgen-ray appearances do not tally with the results of physiological experiment; still, many important practical questions are discussed in a useful manner.

Dr. Arnsperger is careful to lay emphasis on the importance of using the Röntgen-ray method in conjunction with other clinical methods of diagnosis, for it is rarely safe to rely on a Röntgen-ray examination unassisted by a knowledge of the clinical history of the case. It is true that in a case of phthisis (for instance) the extent and distribution of the disease may be shown with great accuracy on the fluorescent screen or on a photographic plate, but in other cases the Röntgen-ray picture is capable of various interpretations, and the most useful information will be derived from the Röntgen-ray examination if the clinical aspects of the case are fully known. Dr. Arnsperger points out the advantages of the fluorescent-screen examination as compared with the examination of skiagrams. Screen examinations enable observations to be made of the living processes in the body, the movements of respiration, the beating of the heart, the pulsation in the aorta, the peristaltic contractions of the stomach, and so on. Skiagrams are chiefly useful in enabling permanent records to be obtained of the appearances described. In some cases, however, the skiagram shows more detail than is to be seen on the more coarse-grained fluorescent screen, and this applies particularly to the quiescent parts of the body, notably the bones and joints. Dr. Arnsperger's book contains twenty-seven plates, upon which fifty-two photographs are reproduced by the half-tone process. It is unfortunate that no known process of reproducing photographs in print represents successfully all the detail which the original negatives show.

A. C. J.

THE CYANAMIDE INDUSTRY OF FRANCE.[2]

IN 1895 Frank and Caro laid the foundations of an important industry by discovering that barium or calcium carbide absorbs nitrogen at a temperature of 800°, and is converted into a cyanamide. They expressed the change by the following equation:—

$$CaC_2 + 2N_2 = CaCN_2 + C.$$

The cyanamide thus produced is a useful nitrogenous manure of the same class as ammonium sulphate, but has the further advantage of adding a calcium compound to the soil.

[1] "Die Röntgenuntersuchung der Brustorgane und ihre Ergebnisse für Physiologie und Pathologie." By Dr. Hans Arnsperger. Pp. 263+27 plates. (Leipzig: F. C. W. Vogel, 1909.) Price 12 marks.

[2] A paper by M. Pluvinage in the Bulletin de la Société d'Encouragement pour l'Industrie Nationale, No. 3, vol. iii.

Cyanamide is made in France at the village of Notre Dame de Briançon, near to Montiers (Savoie). Abundant water-power is available, and is, of course, an essential condition for the success of the industry. At the power station there are now three turbines of 2200 h.p., but provision is made for more when necessary; these produce a three-phase current of 15,000 volts, which is conducted a distance of 11 km. to the factory. There it is transformed; part is used for making calcium carbide, and part for making cyanamide. The calcium carbide obtained has a purity of 80·5 per cent., estimated with sufficient accuracy by measuring the volume of gas evolved on treatment with water. Nitrogen is prepared by Linde's method. Liquid air is fractionated, and the vapours made to pass through a column, where they meet with liquid air, and then, higher up, with liquid nitrogen; in these circumstances, the percentage of oxygen in the issuing vapours is reduced to 7, and then finally to zero.

The calcium carbide is broken up and placed in an electric furnace, about 300 kilos. forming the charge. It is raised to a high temperature in presence of a stream of nitrogen; the operation may last from eighteen to fifty-six hours. The resulting hard mass is then reduced to a fine powder. The daily production is at present 10 tons, but this output could readily be doubled. It is estimated that 2 tons of carbide can be produced per kilowatt per year, and that 2 tons of carbide combine with 500 kilos. of nitrogen. Two grades of cyanamide are sold—one containing 15 per cent. of nitrogen, *i.e.* the quantity present in nitrate of soda, the other containing 20 per cent., the quantity present in sulphate of ammonia. The latter grade also contains 20 per cent. of lime, 7 to 8 per cent. of silica, oxides of iron and aluminium, and 14 per cent. of free carbon, to which the dark colour is due.

When added to the soil, it is rapidly decomposed by bacteria to form calcium carbonate and ammonia thus:—

$$CaCN_2+3H_2O=CaCO_3+2NH_3.$$

The ammonia is then nitrified and taken up by plants.

Direct field trials to ascertain its manurial value were first made in 1901 by Gerlach and Wagner, and have since been repeated in other countries. All experiments prove its value, and show that it is comparable in its effects with sulphate of ammonia. It should be applied before sowing, and may be mixed with basic slag or potassic manures, but not with superphosphates. The dressing recommended is 150 kilos. to 250 kilos. per hectare, or $2\frac{3}{4}$ cwts. to $4\frac{1}{2}$ cwts. per acre, the smaller dressing for cereals, the higher for potatoes and beets. In England it would not be customary to use for these crops more than half the above quantities of "artificial" nitrogenous manures.

THE "PREHISTORIC HORSE" OF BISHOP'S STORTFORD.

A COMPLETE skeleton of a horse was recently found during excavations at Bishop's Stortford. As this skeleton lay in an extended position some six feet below the surface in a deposit which had apparently never previously been disturbed by man, it is conceivable that to belongs to a wild variety which inhabited England in prehistoric times. The Rev. Dr. Irving first thought the skeleton might belong to Hipparion (*Standard,* May 24), but he eventually came to the conclusion that it is the remains of a horse of the Neolithic or Bronze age.

Unfortunately, it seems to be impossible to determine the age of the deposit in which the skeleton was found. The examination of the skull, teeth and limbs indicates that the Bishop's Stortford horse differs from all the known wild horses of the Pleistocene period—from, *e.g.*, the small, stout horse of the "elephant" bed at Brighton; the small, slender-limbed horse of the Oreston Cavern, believed by Owen to be an ass or a zebra; the Prejvalsky-like diluvial horse of Remagen; and the coarse-limbed horse of Westeregeln. On the other hand, the horse described by Dr. Irving and figured in the *Illustrated London News* (June 5) closely resembles a variety from Walthamstow believed to be of Neolithic or Bronze age. This Walthamstow horse was probably a blend of a "forest" and a "steppe" variety in which the broad-browed forest ancestors were dominant. The limb bones indicate that the Bishop's Stortford horse measured from 14 to 14·2 hands (56 to 58 inches) at the withers—several inches more than the Walthamstow horses represented in the British Museum.

It is generally assumed that the horse did not live under domestication in Britain until the end of the Bronze or the beginning of the Iron age, and that the native British horses up to the coming of Cæsar were too small to carry men. The Bishop's Stortford horse was, however, as large and powerful as the Galloways used in border raids. Should the Bishop's Stortford horse be proved to be of Neolithic or Bronze age, we may have to modify our views as to the size of the horses in the possession of the ancient Britons. For an opportunity of examining the skull and limb bones of the Bishop's Stortford horse, I am indebted to the Rev. Dr. Irving.

J. C. EWART.

METEOROLOGICAL STUDIES AT THE BLUE HILL OBSERVATORY.[1]

(1) THIS is an account of the methods employed and the results obtained at St. Louis. Seventy-seven ascensions were made, and in most cases good traces were obtained. The funds were supplied partly by grants from the Exposition Company and from the Hodgkins fund of the Smithsonian Institution, and the remainder by Prof. Rotch.

A very large proportion of the balloons were found, a proportion looked upon with envy by those engaged in similar work in England, and this occurred notwithstanding the fact that they were mostly sent up in the evening to escape the chance of solar radiation.

A full description of the method of working and of calibrating the instruments is given, and every care seems to have been taken to secure accuracy in the results; but it is incorrect to say that the only method of making the registration yet devised is that of writing on a smoked metal surface. The plan of scratching on an electro-plated but unpolished silver surface has answered excellently in England, and Mr. Field's plan of using glass silvered lightly by the ordinary solution seems to be quite satisfactory.

The results from each ascent are published in full, and it appears that about half the ascents afforded records up to 10 kilometres in height. The general conclusion is in striking agreement with that obtained

1 (1) "Exploration of the Air with Ballons-sondes at St. Louis and with Kites at Blue Hill." By H. Helm Clayton and S. P. Fergusson. Pp. 92; 11 plates. (Cambridge, Mass.: The Observatory, 1909.)

"Annals of the Astronomical Observatory of Harvard College." Vol. lxviii., part i., Observations and Investigations made at the Blue Hill Meteorological Observatory, Massachusetts, U.S.A., under the direction of A. Lawrence Rotch.

(2) "Annals of the Astronomical Observatory of Harvard College." Vol. lviii., part iii., Observations and Investigations made at Blue Hill Meteorological Observatory, Massachusetts, U.S.A., in the year 1905, under the direction of A. Lawrence Rotch. Pp. 147–228; 2 plates. (Cambridge, Mass.: The Observatory, 1908.)